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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re patent application of
Hiroaki Matsumoto

Docket No. P27376
Confirmation No. 1887

Serial No.: 10/756,392

Group Art Unit: No. 3683

Filed: January 14, 2004

Examiner: Thomas J. Williams

For: **BRAKE CONTROL APPARATUS**

United States Patent and Trademark Office
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401 Dulany Street
Alexandria, VA 22314

DECLARATION UNDER 37 C.F.R. §1.132
OF
Katsunobu Horikawa

Sir:

I, Katsunobu Horikawa, declare as follows:

1. I am a graduate of Osaka Sangyo University in 1996. My degree is in Mechanical Engineering for Transportation.
2. I have been an employee of Nissin Kogyo Co. from 1996 to present. In this capacity, I have been working as a Research Worker studying about the development of vehicle brake systems
3. My education and years of service in the field of vehicular braking systems establish me as an expert in the field of vehicular braking systems, qualified to provide evidence on the level of skill in the art and on what would be obvious to one of ordinary skill in the art.
4. A person of ordinary skill in the art would have an engineering degree and approximately 10 years of experience in the design of vehicular braking systems.
5. I have reviewed the patent application having US Serial No. 10/756,392 and the entire file history of such application, including the Office Action dated October 31, 2005. I have also reviewed the applied prior art documents US Patent No. 5,632,535

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to Luckevich et al., US Patent No. 5,938,299 to Hara et al., and US Patent No. 6,030,056 to Sawada et al. I am very familiar with the braking systems of these documents.

6. The invention disclosed and claimed in US Serial No. 10/756,392 relates to a brake control apparatus of which I have expert knowledge thereof. In particular, the invention provides for a brake control apparatus which utilizes, among other things, a control unit and a plurality of normally-open-type valves which are controlled by the control unit in order to perform a brake force distribution control. More specifically, the control unit controls the braking such that control unit finishes the brake force distribution control as a vehicle stops and after a frontward force applied to the vehicle is released and prior to a stop of the vehicle. One example of the brake force distribution control is shown in Fig. 2 of US Serial No. 10/756,392. Another example is shown in Fig. 3 of US Serial No. 10/756,392.

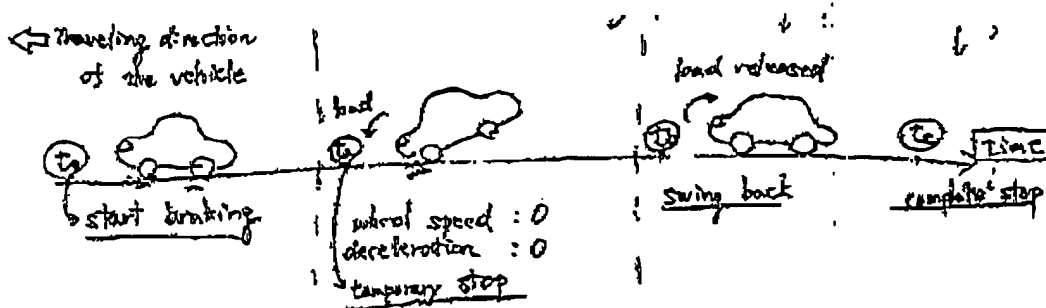
7. The advantage of such an arrangement is that the braking occurs without the driver sensing any noticeable drop in the brake pedal during stopping. This advantage is described on page 14 of the specification of US Serial No. 10/756,392. That is, by implementing the invention described and claimed in U.S. Serial No. 10/756,392, it will be difficult to recognize, by a driver, bringing in of the brake pedal by swing back of the vehicle and thus the operational forces can firmly be prevented from being deteriorated in finishing the brake force distribution control.

8. In my opinion, one of ordinary skill in the art would readily understand the invention. He or she would also recognize from the text and the drawing figures the novelty of the invention. For example, one of skill would readily recognize the recited language in claims 1 and 13. For example, one of skill in the art would readily understand the following recited language, which is well supported in the specification:

...wherein the control unit finishes the brake force distribution control as a vehicle stops and after a frontward force applied to the vehicle is released and prior to a stop of the vehicle.

9. As previously, and correctly discussed in a Response dated September 13, 2005, the above language finds support in the specification at page 13 of the specification of U.S. Serial No. 10/756,392. The following drawings, reproduced below, show the features of the frontward force applied to the vehicle and release thereof, as recited in the claimed invention.

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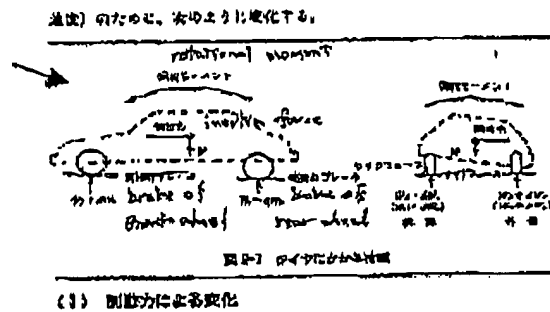
10. Applicant submits that the recited language of the claimed invention is clear and definite and clearly defines the timing with which the brake force distribution control is terminated, in accordance with the invention. As shown in Fig. 2 of the present invention, at a time t_2 , the vehicle speed is below v_0 which is just prior to a complete stop of the vehicle. In addition, at a time t_2 , the frontward force applied to a vehicle is released by increasing the brake fluid pressure on the rear wheel side as shown by the dotted line. The time t_2 is captured as the time t_a in the drawing above, as it is the time at which the vehicle is coming to a stop and as a result, the forward momentum of the car creates a frontward force that is applied to the vehicle. The release of this frontward force causes a backward force which is the swing back motion of the vehicle, which is shown in the drawing above as time t_b . This entire process occurs *prior* to the complete stop of the vehicle, time t_c in the drawing above or time t_3 in Fig. 2, but *after* the release of the frontward force that is applied to the vehicle.

11. Furthermore, one skilled in the art would understand that the load applied ahead of the vehicle is equivalent to the frontward force applied to the vehicle. This is because the frontward force is the force that is applied on the front end of the car which arises from the front wheel brake having more braking power than the rear wheel brake. Hence, the "load applied ahead of the vehicle" is synonymous with the "frontward force applied to the vehicle".

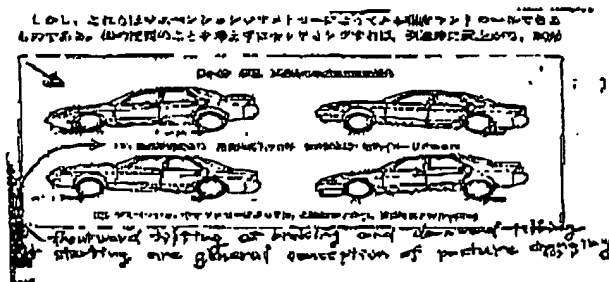
12. To further support my opinion that one of ordinary skill in the art would readily understand the recited features of the claimed invention and that these features are clear and definite, the attached documents, which are studies on vehicular anti-lock braking systems, describe what is meant by a "a frontward force applied". These documents, in combination with the understanding of the invention, e.g., the control system finishes the brake force distribution control as a vehicle stops and after a frontward force applied to the vehicle is released and prior to a stop of the vehicle, should help the Examiner in understanding the distinguishing features of the claimed invention, with respect to the references noted above. These documents include "Study on Vehicular ABS", Edited by Japan ABS, Co., LTD., published on June 30, 1993 and "Performance of Vehicular Movement and Mechanism of Chassis", by Uno Takaki, published on September 10, 1994.

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13. As shown in "Study on Vehicular ABS", it is clearly shown that there is rotational movement, e.g., inertial force, acting on the vehicle when there is a braking force. This inertial force provides an uncomfortable feeling to the driver, which is eliminated by the presently claimed invention of US Serial No. 10/756,392



14. Similarly, "Performance of Vehicular Movement and Mechanism of Chassis", shows a frontward tilting at the braking and downward tilting at starting. These are general conceptions of posture during changing of speeds, which contributes to the uncomfortable feeling of the driver (and of which is solved by the present invention claimed in US Serial No. 10/756,392). This is shown representatively in the below figures of "Performance of Vehicular Movement and Mechanism of Chassis".



15. With the above explanation and illustrations understood, It is my opinion that one of ordinary skill in the art would not find the claimed invention to be disclosed or suggested by the teachings of Luckevich, Hara and Sawada or any combination thereof.

16. One of ordinary skill in the art would recognize that Luckevich does not disclose a control unit that controls the braking such that the brake force distribution control finishes as a vehicle stops and after a frontward force applied to the vehicle is released and prior to a stop of the vehicle. Instead, Luckevich discloses a system which uses a delay of one second prior to the termination of the brake distribution

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control. This delay of one second is implemented so that the vehicle can "come to a complete stop and for the driver to relax pressure on the brake pedal" (see col. 6 lines 4-6). Thus, the flow change resulting from the termination of the brake distribution control is not performed until *after* the delay is complete (col. 6, lines 11-12). As a result, the brake distribution control of Luckevich is terminated only *after* the vehicle has come to a complete stop. In the present invention, however, the brake distribution control is finished *prior* to a complete stop of the vehicle, e.g., to match the swing back motion of the vehicle from the stopping motion and the swing back motion of the pedal resulting from the brake distribution control being terminated. Thus, the present invention is directed towards a time frame that is explicitly contrary to Luckevich.

17. Furthermore, the driver of Luckevich et al. is expected to relax pressure on the brake pedal of his own volition to avoid the sudden drop of the brake pedal, (see column 6 lines 4-6). However, in the present invention, the driver does not have to relax pressure on the brake pedal to avoid the sudden drop of the brake pedal, as the present invention is directed to alleviating this problem. By engineering the system to adjust the timing of the brake control distribution termination process, the sudden drop of the brake pedal can be disguised as part of the swing back motion of the vehicle as the vehicle comes to a complete stop. Thus, unlike the driver of Luckevich et al., the driver using the presently claimed invention is not expected to relax pressure on the brake pedal of his own volition.

18. One of ordinary skill in the art would recognize that Hara does not disclose a control unit that controls the braking such that the brake force distribution control finishes as a vehicle stops and after a frontward force applied to the vehicle is released and prior to a stop of the vehicle. Hara discloses a braking system that uses a brake force distribution control that is terminated under certain types of conditions (see col. 7, lines 40-56), the conditions do not disclose the combination of features recited in at least claims 1 and 13. With regard to condition (1) of Hara, it is notable that the driver using the presently claimed invention is *not* expected to relax pressure on the brake pedal, and thus this condition does not apply. Regarding conditions (2) and (3) of Hara, one of ordinary skill in the art would not discern the relevancy of these conditions to the invention. Regarding conditions (4) and (5) of Hara, these merely relate to situations in which the forward motion of the vehicle is coming to a stop. That is, step (4) for example, merely shows that the condition that arises when the estimated body velocity V_{sof} becomes smaller than a predetermined value, for example, 6 km/h.

19. Hara, however, does not discuss the release of the frontward force applied to the vehicle that is recited in claim 1 or claim 13. More specifically, Hara does not discuss the swing back motion or a frontward force applied of the vehicle that the present invention is directed towards. In the braking procedure of the present invention, just prior to the stopping of a vehicle, there is a swing back motion as the vehicle jerks to a stop. This is the timing that is described by the release of the frontward force applied to the vehicle. There is no discussion in Hara with regard to employing such a

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release of the frontward force applied to the vehicle, and thus, Hara does not teach or suggest all of the limitations of the invention recited in US Serial No. 10/756,392.

20. One of ordinary skill in the art would recognize that Sawada does not disclose a control unit that controls the braking such that the brake force distribution control finishes as a vehicle stops and after a frontward force applied to the vehicle is released and prior to a stop of the vehicle. Sawada discloses a braking system that has pitch control, but the disclosed arrangement does not disclose the combination of features recited in at least claims 1 and 13. The language on col. 15, lines 5-13 of Sawada indicating that pitching motion of the vehicle is suppressed when the vehicle is stopped is not suggestive of releasing the frontward force applied to the vehicle in the manner recited in claim 1 or claim 13. Basically, one of skill in the art could not infer the claimed invention of US Serial No. 10/756,392 by the disclosure of Sawada.

21. It is also my opinion that the dependently claimed inventions are also distinguishable from the references applied by the Examiner in the Office Action of October 31, 2005. For example, claims 6 and 7 recite that the predetermined time is 300msec. However, in Luckevich et al., the brake control termination is carried out after the delay of one second. This is contrary to the claimed invention.

22. I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the above-referenced application and any patent issuing thereon.

Date 9. Mar. 2006.

Katsunobu Horikawa
(Signature)

Katsunobu Horikawa